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Youndegin meteorite shower: a re-assessment of provenance

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Abstract

Field and literature searches have resulted in some modification of the generally accepted find sites of the Youndegin meteorites. A metallic object found 1.9 km NW of Pikaring Hill (32°05'S, 117°43'E) near the find site of Youndegin I-IV might be the small Youndegin iron of 4.66 kg held by the Quairading District High School: Youndegin VII might also have been found in that vicinity. Youndegin V and VI were found within 5 km of Pikaring Hill, not near Wogerlin Hill. The find site of Quairading (Youndegin IX) at 32°09'S, 117°40'E has been re-visited. The precise find sites of the Mount Stirling and Mooranoppin irons remain unknown. No evidence was found that a so-called "crater" near Pikaring Hill was formed by meteorite impact. A tentative strewnfield delineated for the shower indicates atmospheric passage in a westerly direction.

Introduction

The first recoveries of the Youndegin meteorite shower were made near Pikaring Hill, Western Australia in 1884. The meteoritic nature of the material was recognized almost immediately (Fletcher 1887). The name adopted for the meteorite was that of the police outpost at Youndegin, 50km NW of the find site (Fig. 1). These finds and others in the succeeding 45 years were named variously Youndegin I-VIII, Mount Stirling, Mooranoppin I and II and Quairading. The common origin of these masses was demonstrated by de Laeter (1973). A comprehensive account of the meteorite has been given by Buchwald (1975). An additional member of the shower has since been described by de Laeter & Hosie (1985) and a further small mass is currently being examined by A W R Bevan. The investigation of this meteorite thus spans more than a century but only one of the finds is known to have been seen in the field by a scientist and no other field work of any kind was carried out. The present work seeks to rectify the omission but with inevitable limitations arising from the poor definition of some find sites and the lapse of more than 80 years since the major finds were made.

Individual finds

Youndegin I-IV The four irons and abundant iron shale derived from a fragmented and/or disintegrated mass of more than 33 kg were found about 1.2 km NW of the top of Penkarring Rock (Fletcher 1887), now known as Pikaring Hill (Fig. 1). The reported site is about central to Avon Location 14 756 (Fig. 2), now part of the farm of C A & B J Hughes. We searched the vicinity unsuccessfully.

Mr C A Hughes stated that a lump of metal, "double fist-sized, very heavy, not cut by a hacksaw" had been found about 20 years before (*c* 1968) by Mr N Bartlett at a point which he indicated near the NW corner of Location 14 756 (Fig. 2). The object was taken to the Shenton Machinery Co in Quairading where an attempt was made to cut it. Its subsequent history is unknown to Mr Hughes. The vicinity of this find was also searched unsuccessfully.

Youndegin V and VI Mr Louis Knoop found Youndegin V of weight 174 kg in 1891 and Youndegin VI of weight 924 kg in 1892; together with Youndegin I-IV, they were within a radius of *c* 5 km on the Peekerin (Pikaring) sandplain (Anon 1893a). Knoop sold both masses to the mineral dealer J R Gregory of London (Gregory 1892, Anon 1893b). The precise find sites were not disclosed (Glauert 1954).

We are unable to find any justification for the assumption made by Grace & Lemesurier (1954)—more than 60 years after the event—that Knoop found Youndegin V & VI on property which he was said to own 10 miles (16 km) N of Corrigin, *ie* near Wogerlin Hill. This hill, located 32°10'S, 117°50'E, but with longitude incorrectly stated as 118°50'E, has been widely quoted as the find site.

Youndegin VII This mass of 4.1 kg was found by a Mr Finkelstein in 1929 on Finkelstein's farm, which is shown on a small scale map as a single point *c* 6 km NE of Pikaring Hill (Simpson 1938, Fig. 1). Dr Simpson's Mineral Collection Catalogue 1897-1936 records the find site as Avon Location 19 493, which is centred 32°02'S, 117°45'E (Fig. 2). However, the point indicated by Simpson (1938) and widely accepted as the find site was—at least approximately—the farmhouse and Location 19 493 was

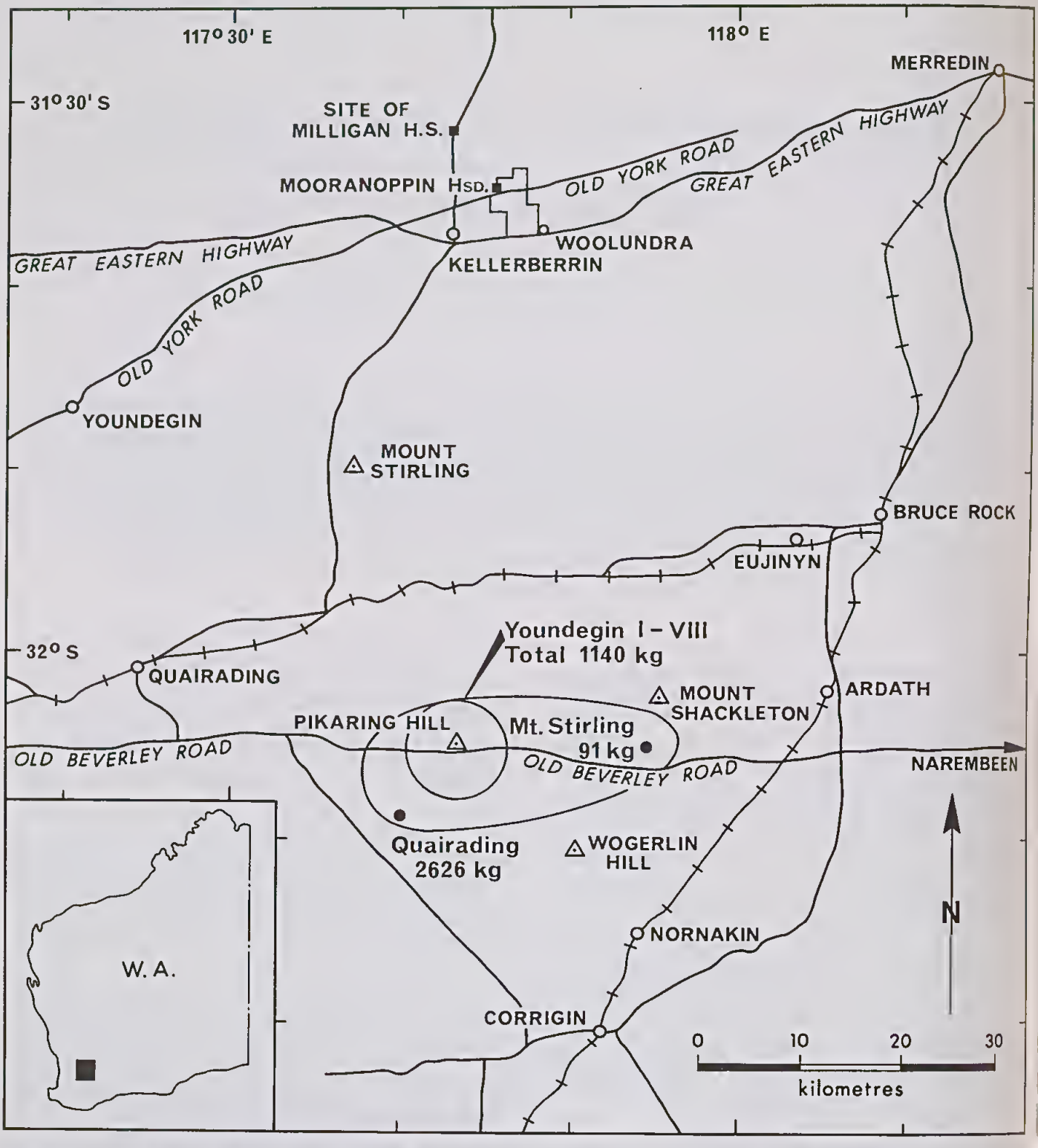

Figure 1 Map of part of Western Australia. Meteorite sites are in lower case letters. In the vicinity of Kellerberrin and Woolundra (upper middle of map), the Great Eastern Highway, the site of the former narrow gauge railway on which was Woolundra, and the present standard gauge railway line are within a few tens of metres of each other. Inset: Western Australia showing location of the map area.

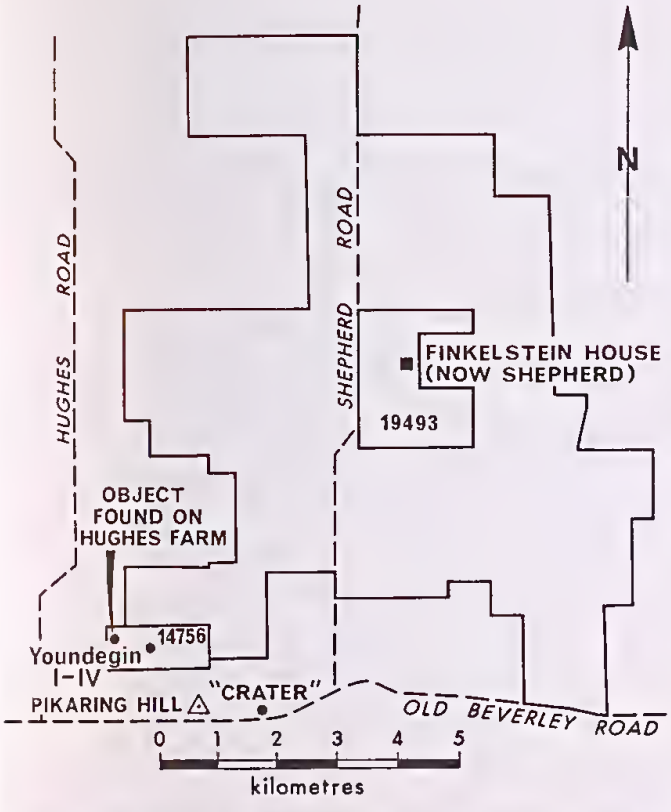

Figure 2 The southern group of 16 Locations held by members of the Finkelstein family in 1929. Only Locations 14 756 and 19 493 are shown individually.

the homestead block. The farm area held by the Finkelsteins in 1929 comprised 29 Locations (H J Murphy, pers comm). The southern locations alone (Fig. 2) had total area *c* 5 000 ha. It would have been a considerable coincidence if Youndegin VII had been found at the homestead or even on the homestead block, which we searched unsuccessfully. We regard the find site as being more probably an unknown point somewhere within Finkelstein's farm. One possibility would be Location 14 756, on which Youndegin I-IV were found 45 years earlier and a metallic object was found *c* 40 years later.

Youndegin VIII This collective name was given by Simpson (1938) to "many fragments in private hands" found by Knoop and others during the period 1891-1929 and said to aggregate *c* 14 kg. No find sites were recorded but the mention of Knoop and the range of dates suggest that these minor fragments were associated with Youndegin V, VI and VII.

Mount Stirling This mass was sold to the Australian Museum by Mr J F Connelly for £50 and entered in the Museum register on 5 April 1897 as "Meteorite from West Australia weighing 200 1/8 lbs" (90.8 kg). The locality was recorded as "nr Mount Stirling about 25 miles away in a SE direction ....". The following remarks were added: "Found on an open plain exposed on the surf. and surrounded by a considerable quant. of iron oxide which had scaled off. Existence known for at least five years". A further piece from the same locality weighing 0.42 kg was received at the Australian Museum later (Cooksey 1899).

Connelly was a life-long prospector (Erickson 1986). His site statement for a valuable asset must therefore be regarded with considerable caution. The statement is very rounded both in direction and distance. The locality could better have been referred to some much closer feature such as Mt Bebb, which is halfway between the stated site and Pikaring Hill and had already been named in 1897. Confusion between nearness and distance has caused some writers to place the find site at the mount itself (*eg* Woodward 1912) and *vice versa* (Eaton 1979).

Extensive enquiries by the authors at farmhouses within a sector centred on Mount Stirling and extending from Nornakin to Ardath (Fig. 1) produced no additional information. Connelly memorabilia and family letters were searched unsuccessfully by Ms K-J Connelly. The original statement has had to be accepted, though it may be intentionally vague as in the case of Youndegin V & VI, which were also sold by their finder.

Mooranoppin Mooranoppin I, of mass 1.1 kg, was brought in to Mr R B Leake of Mooranoppin farm by an aborigine, who had found it on the sandplain in the vicinity (Woodward 1896). Pikaring Hill, the focal point of previous finds, is 55 km S of the farm (Fig. 1). Subsequently, Woodward (1897, 1912) stated that the mass had been found in 1893 or before and left at Mr Massingham's. Massingham was Leake's neighbour on Milligan Station, a few kilometres NNW of Mooranoppin. Mooranoppin, unlike Milligan, was on the road to York (Fig. 1). In the geography of the early 1890s, an object from Milligan would almost certainly have passed via Mooranoppin en route to the Museum in Perth. Original incorrect attribution to Mooranoppin might thus have occurred. No doubts were expressed about a find site in this general vicinity until 45 years later, when Simpson (1938) referred to a site "somewhere to the south". Not all later writers (*eg* Glauert 1954) have accepted this change, for which the source of information was not stated. Mooranoppin II, of weight 0.82 kg, was reported by Simpson (1938) to have been brought to Mooranoppin farm about the same time and from the same place as Mooranoppin I, and to have been kept there until given to him by R Maitland Leake (son of R B Leake) about 1933, *c* 40 years after being found.

We found no evidence that the find site of Mooranoppin I & II was other than in the general area north of Kellerberrin (Fig. 1). The disposition of the Youndegin meteorites would therefore have been analogous to the Mundrabilla meteorites and the distant Tookana Rockhole recovery (de Laeter & Cleverly 1983). However, a curious coincidence was noted.

At some time prior to 1900, Louis Knoop, the finder of Youndegin V, VI and VIII (in part), established Knoop & Co, eucalyptus oil manufacturers and sandalwood merchants, with addresses in Fremantle and Woolundra (Anon c 1900). Woolundra was the first railway station east of Kellerberrin on the former 3'6" railway line and was situated at the eastern boundary of Mooranoppin farm (Fig. 1). As a sandalwood merchant, Knoop would have had the heavy wagons necessary to transport loads of sandalwood (or meteorites) to be railed from his Woolundra depot. Thus Mooranoppin I & II, the only pieces of the Youndegin meteorite found far distant from the others, had been brought in to people who were the neighbour(s) of Louis Knoop.

Quairading (syn Youndegin IX) The heaviest member of the shower (2 626 kg) was re-discovered by Mr E C Johnson on Avon Location 23 656, where it was examined by Fimmell (1952). It had been found initially by Mr H Johnson in 1903 (letter dated 23 April 1953 on WAM file "Meteorites before 1963"). A few pieces of iron shale found by the authors near the SW corner of Avon Location 23 656 confirmed the find site as being nearly 6 km E of Wamenusking Sports Centre and 30 km in direction 121° from the town of Quairading (Fig. 1).

Youndegin iron, 4.66 kg A small un-named iron acquired by Quairading District High School before 1972 from an unrecorded source is a member of the Youndegin shower (de Laeter & Hosie 1985). The iron may have been received at the school about 1967 (E Martindale, pers comm).

Circumstantial evidence suggests that this iron could be the object found on Hughes' farm. There is, on the one hand, a dense metallic object, double-fist sized, found *c* 1968 and taken to Quairading, where it proved extremely resistant to cutting. There is, on the other hand, a Youndegin iron, 16 × 14 × 8 cm, of high hardness, acquired by Quairading District High School before 1972, perhaps in 1967. Mr C A Hughes is unable to confirm the identification with certainty, his recollections—now unsure—being of a more compact and redder object, but neither does he dismiss the identification as impossible.

Youndegin iron, 1.50 kg A small, unnamed iron registered in 1929 as No. 8629 in the collection of the Geology Department, University of Western Australia has been identified as a member of the Youndegin shower; two abortive attempts had been made to cut it (A W R Bevan pers comm).

Youndegin VII was found in 1929 (Simpson 1938) and this iron was acquired by the University in the same year. There are long time intervals in the sequence of finds both before and after that year. Conceivably, this iron could be a reason why Simpson (1938) defined Youndegin VIII as including fragments found up to 1929.

So-called "meteorite crater" A feature 1 km E of Pikaring Hill and 60 m north of Old Beverley Road is considered by some local people to be a meteorite crater (Fig. 2). The "crater" is 27 m diameter inclusive of the very low, washed-out, circumferential mound of displaced material. There is rather more than 1 m of relief from the granite exposed in the bottom of the pit to the top of the mound.

No meteoritic material or iron shale was found. The granite shows no evident shock or cataclastic effects. The only features suggestive of a crater are as follows. The smooth elevational profile of the mound is unlike excavated soaks such as that 0.5 km in direction 330° from Pikaring Hill, where spoil dumps are of the unequal size and spacing dictated by convenience of excavation. However, the smoothness may be a consequence of considerable age; the "crater" has been known since at least early in this century (J H Shepherd, pers comm). The site is an unlikely one for a soak (agreed by both local people and the authors). However, excavation may have been prompted by water seepage from the gaping joint now exposed in the bottom of the pit. Finally, there is the purely circumstantial evidence that the "crater" is within the 5 km circle enclosing the find sites of Youndegin I-VI and perhaps of several minor masses also. This suggests that the local farming community, who have no experience of a genuine meteorite crater, have some tradition of meteorite recoveries in the vicinity.

The "crater" is probably the one reported to the Western Australian Museum on an earlier occasion and regarded as a soak by G J H McCall (pers comm). It would therefore be the soak indicated by McCall & de Laeter (1965, Fig. 3).

Conclusions

The preferred find sites of the Youndegin meteorites are presented in Table 1. It is unlikely that precise sites will ever be known for some members of the shower. An attempted delineation of the strewnfield is shown in Fig. 1, from which it appears that the Youndegin meteoroid travelled W or somewhat S of W. It fragmented in the atmosphere to produce the Mount Stirling and Quairading meteorites and perhaps also a third mass which was secondarily fragmented to produce eventually the Youndegin I-VIII meteorites. Some of the smaller masses were detached from major masses as the result of prolonged weathering rather than by fragmentation in the atmosphere. The find site of the Mount Stirling meteorite is, at best, very approximate. Correction of this site could lead to a radical change in the form and orientation of the strewnfield. One or two small masses may have landed distantly and independently a few kilometres N of Kellerberrin.

Table 1

Find sites of Youndegin meteorites

Meteorite	Find site according to (a)[1] & (b)[2]	Find site (this paper)
Youndegin I-III	(a) & (b) 32°02'S, 117°35'E	32°05'S, 117°43'E
Youndegin IV	(a) 32°10'S, 118°50'E (b) 32°02'S, 117°35'E	32°05'S, 117°43'E
Youndegin V & VI	(a) & (b) 32°10'S, 118°50'E	Within 5 km of 32°05'S, 117°43'E
Youndegin VII	(a) & (b) 32°03'S, 118°46'E	Same as Youndegin I-IV (?)
Youndegin VIII	—	Same as Youndegin V, VI and VII
Mount Stirling	(a) 31°58'S, 117°55'E (b) 32°06'S, 117°55'E	Perhaps very approx 32°05'S, 117°55'E
Mooranoppin I & II	(a) Approx 31°35'S, 117°46'E (b) 31°45'S, 117°45'E	General vicinity of 31°34'S, 117°44'E
Quairading	(a) & (b) 32°10'S, 117°42'E	32°09'S, 117°40'E
Youndegin iron, 4.66 kg	—	Same as Youndegin I-IV (?)
Youndegin iron, 1.50 kg	—	Same as Youndegin VII (?)

[1] McCall & de Laeter (1965)
[2] Buchwald (1975)

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References

Anon 1893a Portion of meteorite. The Inquirer and Commercial News, Perth, 20 July.

Anon 1893b Notes. Nature 47: 469-470.

Anon c 1900 The Western Australia Post Office Directory (Wise's) for 1900. Wise's Directories, Perth.

Buchwald V 1975 Handbook of Iron Meteorites. Their History, Distribution, Composition and Structure. Vol 3, Univ California Press, Berkeley.

Cooksey T 1899 Additions to the catalogue and bibliography of Australian meteorites. Rec Aust Mus 3: 131-132

de Laeter J R 1973 The Youndegin meteorite shower. Meteoritics 8: 169-179.

de Laeter J R & Cleverly W H 1983 Further finds from the Mundrabilla meteorite shower. Meteoritics 18: 29-34.

de Laeter J R & Hosie D J 1985 A further find from the Youndegin meteorite shower. J R Soc W Aust 68: 17-20.

Eaton F 1979 The Golden Grain and the Silver Fleece. A History of Quairading. Wescolour Press, East Fremantle.

Erickson A (edit) 1986 Dictionary of Western Australians Vol 5, Univ W Aust Press.

Fimmell L H 1952 Report by L H Fimmell on meteorite on Avon Location 23 656—Lands Dept Litho 344/80. Internal report of W Aust Geol Surv dated 14 May.

Fletcher L 1887 On a meteoric iron found in the sub-district of Youndegin, Western Australia and containing cliftonite, a cubic form of graphitic carbon. Miner Mag 7: 121-130.

Glauert L 1954 The meteorites of Youndegin. West Australian, 10 July.

Grace J N A & Lemesurier C R 1954 Government Chemical Laboratories, Perth No. 2919, Report on the Quairading meteorite for the Government Geologist, Perth. Lab No 2939/52.

Gregory J R 1892 A large meteorite from Western Australia. Nature 47: 90-92.

McCall G J H & de Laeter J R 1965 Catalogue of Western Australian meteorite collections. Spec Publ W Aust Mus 3.

Simpson E S 1938 Some new and little-known meteorites found in Western Australia. Miner Mag 25: 157-181.

Woodward B H 1896 Letter to H A Ward dated 11 June. No 489 in Letter book No. 1, 1895-6 of the Western Australian Museum.

Woodward B H 1897 Letter to T Cooksey dated 18 October. No 155-6 in letter book No. 3, 1897-8 of the Western Australian Museum.

Woodward B H 1912 Guide to the Western Australian Museum. Part VI The Mineral Collections. Paragon Printine & Publishing Co, Perth.